

**AMENDMENTS TO THE SPECIFICATION**

**Please replace the paragraph beginning at page 2, line 4 with the following rewritten paragraph:**

--Until ~~recent~~ recently, there have been developed various coating resins for steel plates of solvent types or aqueous types. In regard to a functional steel plate, a conventional coating resin can be referred to in Japanese[[,]] Pat. Laid-Open Publication No. Hei. 5-138120. In this reference patent, bisphenol type epoxy resins, multi-functional epoxy resins, alkyd resins, ester resins, acryl resins, urethane resins, and modified derivatives thereof are mentioned along with curing agents such as various amine compounds, ~~animo~~ amino resins, and isocyanate compounds. However, they are not described in detail, but simply enumerated ~~simply~~. Further, their use ranges are too wide to discriminate resin properties.--

**Please replace the paragraph beginning at page 4, line 14 with the following rewritten paragraph:**

--In accordance with a first embodiment of the present invention, there is provided a method for preparing an aqueous urethane resin composition, comprising the steps of: (1) producing an aqueous polyurethane resin solution by (a) reacting 100-150 parts by weight polyester polyol, 30-50 parts by weight diisocyanate, 5-15 parts by weight dimethyl propionic acid or dimethyl butyric acid, and 3-10 parts by weight amine at 55-85 °C for 5-6 hours to give a prepolymer ranging, in NCO radical content, from 2 to 8%, said dimethyl propionic acid or dimethyl butyric acid serving as a hydrophilic moiety for water dispersion; (b) dispersing the prepolymer at 30-40 °C in water; and (c) introducing into the water-dispersed prepolymer a chain extender selected from the group consisting of glycol, triol and

diamine at 25-30 °C in such a way that the reaction mole ratio between said chain extender and NCO residues is controlled to give the final product ~~with~~ a molecular weight of 30,000-100,000; (2) adding the aqueous polyurethane resin solution with block isocyan type or aziridine type curing agent at an amount of 3-15 % by weight based on the weight of the resin solid content.--

**Please replace the paragraph beginning at page 5, line 5 with the following rewritten paragraph:**

--In accordance with a second embodiment of the present invention, there is provided a method for preparing an aqueous lubricant urethane resin composition, comprising the steps of: (1) producing an aqueous polyurethane resin solution by (a) reacting 100-150 parts by weight polyester polyol, 30-50 parts by weight diisocyanate, 5-15 parts by weight dimethyl propionic acid or dimethyl butyric acid, and 3-10 parts by weight amine at 55-85 °C for 5-6 hours to give prepolymer ranging, in NCO radical content, from 2 to 8%, said dimethyl propionic acid or dimethyl butyric acid serving as a hydrophilic moiety for water dispersion; (b) dispersing the prepolymer at 30-40 °C in water; and (c) introducing into the water-dispersed prepolymer chain extender selected from the group consisting of glycol, triol and diamine at 25-30 °C in such a way that the reaction mole ratio between said chain extender and NCO residues is controlled to give the final product ~~with~~ a molecular weight of 30,000-100,000; (2) adding the aqueous polyurethane resin solution with block isocyan type or an aziridine type curing agent at an amount of 3-15 % by weight based on the weight of the resin solid content; (3) adding a mixture comprising a fluorine resin-modified polyethylene and a polyethylene wax at a ratio of 1 : 0.3 - 1 : 0.7 to the resin solution at an amount of 5-30 % by weight based on the weight of the resin solid content, said fluorine

resin-modified polyethylene wax ranging, in specific gravity, from 0.98 to 1.02 with a particle size of 0.1-1.5  $\mu\text{m}$ , said polyethylene wax ranging, in molecular weight, from 1,500 to 3,000 with a particle size of 0.05-1.0  $\mu\text{m}$ ; (4) adding a colloidal silica in the resin solution obtained in the step (3) at an amount of 10-30 % by weight based on the weight of resin solid content; (5) adding in the resin solution obtained in the step (4) a coupling agent selected from the group consisting of silane coupling agents containing an epoxy group, an amine group, and/or an acryl group and titanium coupling agents containing phosphorus and/or an amine group at an amount of 0.1-0.5 % by weight based on the total weight of the resin solid content; and (6) diluting the resin solution with pure water into a final resin solid content of 10-30 % by weight.--

**Please replace the paragraph beginning at page 7, line 18 with the following rewritten paragraph:**

--To obtain the urethane prepolymer, polyester polyol, diisocyanate, dimethyl propionic acid or dimethyl butyric acid, and amine are reacted. By virtue of its ~~hydrophilicity~~ hydrophilicity, the dimethylpropionic acid or dimethyl butyric acid plays a role in the water dispersion of the prepolymer, later.--

**Please replace the paragraph beginning at page 8, line 12 with the following rewritten paragraph:**

--The diisocyanate, which is forming a ~~prepolyme~~ prepolymer having urethane group, is selected from the group consisting of diphenylmethane diisocyanate (MDI), tolylene diisocyanate (TDI), isophorone diisocyanate (IPDI), and mixtures thereof and added at an amount of 30-50 parts by weight based on the total weight of the prepolymer reactants, and

preferably at an amount of 35-40 parts by weight. For instance, when the diisocyanate content is below 30 parts by weight, the backbone contains too small urethane content, so that the film lacks flexibility. Thus, upon processing, the resin is peeled off and is poor in paint adhesion. On the other hand, diisocyanate content more than 50 parts by weight brings about a deterioration in general film properties, including yellowing occurrence and chemical resistance reduction.--

**Please replace the paragraph beginning at page 9, line 32 with the following rewritten paragraph:**

--At the reaction initiation step of the prepolymer synthesis, amine may be added. However, since amine serves not only as a neutralizing agent, but also as a catalyst for the urethane reaction between ester polyol and diisocyanate, it is preferable that about 60 % of the amount to be used is added at the polymerization initiation step of the prepolymer and the remainder is fed at the termination point of the reaction before the dispersing of the prepolymer in water. Available is any of primary, secondary, and tertiary amines, examples of which include n-butyl amine, diethyl amine, triethyl amine, triethanol amine, and ethylene diamine with preference to triethyl amine. In addition to possessing an excellent water solubilization potential, triethyl amine is advantageous in that since its boiling point is as low as 90 °C, it does not remain on the steel plate after coating the resin solution on the steel plate.--

**Please replace the paragraph beginning at page 11, line 12 with the following rewritten paragraph:**

--Thereafter, a chain extender is added to the water-dispersed prepolymer to synthesize aqueous polyurethane resins. The addition of the chain extender is executed at the point that the reactants form a complete aqueous phase. The chain extender is fed at the same equivalent as that of the remaining ~~NOC~~ NCO %. When considering that there may be a difference between the theoretical ~~NOC~~ NCO % and the practical ~~NOC~~ NCO %, it is preferable that 90 % rather than 100 % of the amount of the chain extender is added and sufficiently reacted. A reaction sample is taken during the extension and analyzed by IR spectroscopy to determine whether the remaining amount is to be fed or not.--

**Please replace the paragraph beginning at page 11, line 25 with the following rewritten paragraph:**

--By way of example, and not limitation, the chain extender is one or two selected from glycols, such as ethylene glycol, 1,4-butylene glycol and 1,6-hexanediol, diamines, such as ethylene diamine and isophorone diamine, triols such as trimethylol propane. The reaction ~~temperative~~ temperature maintains 25-30°C.--

**Please replace the paragraph beginning at page 11, line 31 with the following rewritten paragraph:**

--The reaction temperature must be low enough for ~~not to react~~ the NCO groups of the prepolymer not to react to water, but high enough ~~to proceed~~ for the reaction to proceed.--

**Please replace the paragraph beginning at page 12, line 10 with the following rewritten paragraph:**

--By precisely controlling the mole ratio between the NCO groups remaining in the prepolymer and the chain extender, the final molecular weight of the resin is determined. The urethane resin of ~~this~~ this invention is determined to range, in molecular weight, from 30,000 to 100,000. A urethane resin with a molecular weight of less than 30,000 is poor in chemical resistance while a urethane resin with a molecular weight of more than 100,000 is too rapidly dried after being coated and, thus, poor in coating workability. Thus, with the aid of the chain extender, there is obtained an aqueous solution of urethane resins which have a molecular weight of 30,000-100,000 and are of high chemical resistance and film coatability.--

**Please replace the paragraph beginning at page 12, line 24 with the following rewritten paragraph:**

--Remarkably good as it is in chemical resistance, the urethane resin solution obtained by ~~the step(1)~~ step (1) may be problematic when it is under an alkali condition like a degreasing process condition. In general, because resins are more vulnerable to alkali than acid, a trace of resin dissolution is found. To bring about an improvement in the chemical resistance and surface physical properties of the film, an aziridine type or block isocyan type curing agent is used at an amount of 3-15 % by weight based on the weight of the total resin solid content. For example, if the amount of the curing agent is below 3 % by weight, a desired improvement is not achieved in alkali resistance. On the other hand, if the amount of the curing agent is over 15 % by weight, the film is deteriorated in paint adhesion, solution stability, surface appearance such as gloss, and processability.--

**Please replace the paragraph beginning at page 14, line 7 with the following rewritten paragraph:**

--In contrast, the fluorine resin-modified polyethylene type wax, in which fluorine resin type wax particles are associated with polyethylene type wax particles in such a way that fine fluorine resin type wax particles are modified to surround polyethylene wax particles with significant bonding forces, has a specific gravity of 0.98-1.02, so that the aqueous lubricant urethane resin composition is improved in lubricating ability and physical properties.--

**Please replace the paragraph beginning at page 15, line 15 with the following rewritten paragraph:**

--Preferably, the weight ratio of the fluorine resin-modified polyethylene type wax to the polyethylene type wax in the wax mixture ranges from 1:0.3 to 1:0.7. If the weight ratio of the polyethylene type wax is below 0.3 on the basis of the fluorine resin-modified polyethylene type wax, the effect of the polyethylene type wax is not sufficiently expressed so that the continuous workability becomes poor. On the other hand, if the ~~weigh~~ weight ratio is over 0.7, the physical properties of the polyethylene type wax are dominantly expressed while the deep machinability is poor.--

**Please replace the paragraph beginning at page 18, line 5 with the following rewritten paragraph:**

--The heat provided during a baking process cures the lubricant resin of the present invention. In this regard, the baking temperature is determined within the range of 110-200°C as the plate temperature is measured. The resin on the steel plate whose

temperature is below 110°C is not sufficiently cured so that it is deteriorated in chemical resistance. Also, the coat may remain undried. On the other hand, the steel plate is physically transformed at 200°C or higher. After baking, ~~quenching~~ the steel plate is quenched in water.--

**Please replace the heading on page 20, line 20 with the following rewritten heading:**

--[[<]] Corrosion Resistance [[>]]--

**Please replace the heading on page 20, line 27 with the following rewritten heading:**

--[[<]] Chemical Resistance [[>]]--

**Please replace the heading on page 21, line 15 with the following rewritten heading:**

--[[<]] Friction Coefficient [[>]]--

**Please replace the heading on page 21, line 26 with the following rewritten heading:**

--[[<]] Processability [[>]]--



**Please replace the heading on page 22, line 4 with the following rewritten**

**heading:**

--[[<]] Film Characteristics [[>]]--

**Please replace the heading on page 26, line 28 with the following rewritten**

**heading:**

--[[<]] Corrosion Resistance [[>]]--

**Please replace the heading on page 27, line 4 with the following rewritten**

**heading:**

--[[<]] Chemical Resistance [[>]]--

**Please replace the heading on page 27, line 24 with the following rewritten**

**heading:**

--[[<]] Friction Coefficient [[>]]--

**Please replace the heading on page 28, line 3 with the following rewritten**

**heading:**

--[[<]] Deep Machinability [[>]]--

**Please replace the heading on page 28, line 16 with the following rewritten**

**heading:**

--[[<]] Appearance of Processed Surface [[>]]--

**Please replace the paragraph beginning at page 30, line 5 with the following rewritten paragraph:**

--Aqueous lubricant urethane resin solutions were prepared as indicated in Table 3. The polyethylene wax used was one purchased from Daedong, Korea, identified as PS-35, which has a solid content of 26 wt%. The fluorine-modified polyethylene wax was 25 wt% in solid content and commercially ~~available~~ available. Each of the aqueous lubricant resin solutions was applied to the resin composition prepared in Example 5-2. The aqueous lubricant urethane resin compositions thus obtained were tested for deep machinability and post-processing appearance as in Example 2.--

**Please replace the paragraph beginning at page 31, line 9 with the following rewritten paragraph:**

--As described hereinbefore, the aqueous lubricant urethane resin composition for thin film coating prepared according to the present invention is superior in various physical properties, including corrosion resistance, paint adhesion, chemical resistance, processability, and surface friction properties and suitable as a binder resin for coating functional steel plates. A lubricant coating solution containing the aqueous urethane resin, when applied as a thin film to a steel plate, ~~gives a great contribution~~ contributes greatly to improving the steel plate in corrosion resistance, chemical resistance, deep machinability, post-processing appearance, and surface friction properties as well as enables the steel plate to be processed into products under an oil-less condition. This oil-less condition results in omitting a degreasing process, thereby bringing about ~~a favor~~ favorable results economically and environmentally.--